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Takeovers and Public Securities

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Valuation of Options: s. 43(6)(b) Companies (Acquisition of Shares) Code; Critical Note of Kingston v. Keprose Pty Ltd*

In *Kingston v. Keprose Pty Ltd (No. 2)* ((1987) 6 A.C.L.C. 111), the Supreme Court of New South Wales (Bryson J.) was called upon to value options for the purchase of unissued shares in a company which had been taken over. Under s. 43 of the *Companies (Acquisition of Shares) (New South Wales) Code*, a person holding, inter alia, a renounceable option may require a successful takeover offeror to acquire the option. On application, under s. 43(6)(b), the court may give an order as to the terms of the acquisition. *Kingston v. Keprose Pty Ltd* is the first reported

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case in which such an order was made. It is submitted that this decision does not accord with economic theory.

Valuation Technique Used

The statute gives no formula for valuation of an option, leaving the matter at the court's discretion. The procedure adopted by Bryson J. can be summarised shortly:

(1) determine the net tangible asset backing of each share, assuming exercise of the options. Because, in this case, the options are over unissued capital, their exercise increases the value of the company by the exercise price. Further, exercise increases the number of shares outstanding by the number of options exercised (at 119);

(2) estimate the value of intangible assets and divide this up among the number of shares of the target company assuming exercise. Bryson J. does this implicitly, by observing that shares in the relevant industry class were trading at a premium over net asset backing, and allowing for this premium in the valuation of these shares (at 120);

(3) subtract, from the net asset backing per share, the exercise price of the options (at 119);

(4) allow a "time value" as a premium on the value of the option. In effect, this allows the option-holders the interest which they would have earned by investing the exercise price in some other security until the exercise date of the option (at 119);

(5) discounting the value of the option, thus determined, by an amount which was set arbitrarily on account of the release of the option-holder from the uncertainty of "speculation" (at 120).

With respect, it is submitted that Bryson J. followed a correct valuation procedure throughout the first four steps listed. However, his Honour failed to take into account the generally used model for pricing options, developed by Black and Scholes ("The Pricing of Options and Corporate Liabilities" (1973) 81 *Journal of Political Economy* 637), which shows that the holder of a contingent claim actually values additional uncertainty in the probability distribution of returns to the underlying asset. Had Bryson J. accepted this principle, it is submitted that step (5), above, would have been the allowance of a premium (not a discount) on the value of the options. The premium would have been a positive function of the variance of the percentage rate of return on the underlying shares. Variance of the rate of return of a share is a measure of the dispersion of returns, or the "risk". The greater the variance, the more chance there is that very high or very low returns will be earned on the share.

Variance of Shares is Valuable

The uncertainty associated with the rate of return of the shares underlying an option has a positive value for option-holders, not a negative value. This may seem counter-intuitive, since the greater the risk (variance) associated with a given expected return on an asset, the lower the value of the asset (assuming risk aversion). However, in valuing an option, Black and Scholes (1973) consider the risk of the underlying share—not the risk of the asset (option) which they are valuing. The positive relationship between the risk of the returns on the underlying share and the value of an option on that share is apparent from the nature of option contracts.

Options, in the sense used in the report of this case, are the right to purchase some other assets at a specified price on a specified date or dates. (We restrict ourselves to considering call options. Put options can be valued by an analogous method.) The specified price is the "exercise price". If the underlying asset is worth less than the exercise price at the expiry date of an option, the option will expire unexercised. In this way, an option-holder only loses the purchase price of the option where the share's value is below exercise price. He does not suffer all the loss to wealth experienced by a shareholder when a share decreases below the exercise price. His downside is limited.

However, an option-holder has full advantage of all the probability distribution of the returns on the shares lying above the exercise price.

Therefore, because of the limited downside losses, the larger the variance of the rate of return to the asset over which the option is held, the more valuable the option, all else being equal. As the variance of the underlying share's returns increases, the option-holder has a greater probability of capturing high positive returns on exercise of the option. The formal derivation of this result is in Black and Scholes (1973) (ibid.).

Thus, being released from the uncertainties of the market-place had a negative value for option-holders in this case. Far from having the value of their options discounted, option-holders were entitled to a premium. They had been deprived of the opportunity of making a large gain while limiting downside loss.

Although Black and Scholes (1973) (ibid.) was cited to the learned judge, Bryson J. felt unable to find, on the balance of probabilities, that the positive relationship between the variance of the rate of return on the shares and the value of an option over the shares was proven. However, his Honour states (at 119) that this relationship could have been proven, had the plaintiff cited empirical work supporting Black and Scholes' result. The citation of a large body of empirical literature supporting the Option Pricing Model (OPM) would present no great difficulty to a party in any future case. This literature supports the posited positive relationship between variance of share returns and value of option.

Black and Scholes ("The Valuation of Option Contracts and a Test of Market Efficiency" (1972) 27 *Journal of Finance*, 399) report on the accuracy of their OPM, in pricing contracts written between 1966 and 1969 in the United States "over the counter" option market. Their sample consisted of over 5,000 contracts written over 545 different securities. When estimating the variance of the rate of return on the shares by using data contemporaneous with the life of the option contract, model prices did not differ significantly from market prices.

Following Black and Scholes (1972) (ibid.), other authors have confirmed this result, extended the applicability of the model, and refined the calculation of inputs to the valuation model. The result is a body of literature confirming Black and Scholes' original conclusions, one of which was that the variance of the underlying shares' returns is positively related to the price of an option over the shares.

Extensions and Refinements

There have been two areas of refinement to Black and Scholes' original techniques. First, Black and Scholes' restrictive assumptions have been relaxed. Black and Scholes (1973) (ibid.) assumed that options were over non-dividend paying shares, and that options were exercisable only at expiration date. An extension of Black and Scholes' reasoning has made the model more generally applicable. Secondly, as Black and Scholes (1972) (ibid.) find, the variance of the underlying shares' returns is difficult to estimate. However, the problem may not be so great in application of s. 43(6) of the Code, and could be overcome to a large extent in any case.

Relaxing Assumptions

Black and Scholes' (1973) (ibid.) model assumes an option is exercisable only at the expiration date (such options are called "European" options), whereas many options can be exercised at any time up to that point as well (these are "American" options). Further, Black and Scholes (1973) (ibid.) assumed that no dividends were paid on the share.

Roll ("An Analytical Valuation Formula for Unprotected American Call Options on Stock with Known Dividends" (1977) 5 *Journal of Financial Economics* 251) extended the original model, by relaxing both assumptions. Roll treats an American call option on dividend-paying stock as a combination of three options, and thus is able to value it by using similar reasoning to Black and Scholes (1973). Sterk ("Tests of Two Models for Valuing Call Options on Stock with Dividends" (1982) 37 *Journal of Finance* 1229) tested the accuracy of Roll's model. The average deviation of model prices from observed market prices was 3.3 per cent. This represents an improvement over the simple Black and Scholes model.

Estimating Risk of Underlying Shares

Black and Scholes (1972) (ibid.) find that by using estimates of the risk of the underlying shares' returns, calculated from data of a previous year, their model systematically overestimated (underestimated) the value of options on high (low) variance securities. However, they find that the model estimates accurately if the actual

variance of the shares' returns prevailing during the life of the option is used in the model.

In many cases, under s. 43(6)(b) of the Code, some contemporaneous data will be available. Under the section, the value of the option is set as at the date of the notice, to the offeror company, requiring purchase. By the time the matter comes to trial, there will be at least some variance data available for the period after the notional date of sale, if the shares continue to trade.

Another approach to estimating variance of returns to the underlying shares would be to use "implied standard deviations" (ISDs). ISDs are calculated by turning the Black-Scholes equation around, so that standard deviation of the underlying shares' returns is calculated, using past option prices. (Of course, the usual form of the Black-Scholes equation calculates option price from, inter alia, the standard deviation of returns.) ISDs capture any misspecification of the Black-Scholes model, as well as estimating variance. Brown and Shevlin ("Modelling Option Prices in Australia Using the Black-Scholes Model" [1983] *Australian Journal of Management* 1) found median percentage pricing differences of 1 per cent or less, when comparing market prices with model prices calculated using ISDs.

The results of a large body of literature in Australia, the United States and elsewhere support Black and Scholes' theory that the price of an option is a positive function of the variance of the underlying asset's returns.

Conclusion

A model is available to parties wishing to value options. It yields prices that are in close accord with market values of the options.

One of the central implications of the Black and Scholes model is that risk of the underlying shares is valuable to option-holders. Thus, it is submitted that important steps in future litigation of s. 43(6)(b) of the Code will be the provision of empirical evidence supporting the Black and Scholes model and its variants, and estimation of the variance of share returns. This will allow the determination of a premium to option-holders, calculated as a positive function of the variance or the risk of the underlying shares.

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